

# Philosophy in Quantum Mechanics Novel Interpretation Supports Einstein's Objection

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**Abstract:** *The quantum mechanics interpretation has no general agreement in the scientific community and all the attempts in some way challenged our reason and logic. In 2021 a novel interpretation considers that space can be in oscillation between the observable 3D and the 4<sup>th</sup> dimension (Ct). This ephemeral situation out of 3D gives a unique understanding of quantum mechanics phenomena preserving the proven quantum math. With this theory of space, philosophy in quantum mechanics gets reasonability and logic in the description of the known quantum effects providing additionally a new vision of the physical 4D universe. Issue such as the law of non-contradiction, the law of large numbers, the certainty principle, realism, the Loschmidt paradox, locality and causality, free will, the whole is greater than the parts, etc. are treated in this paper. The alternance with the 4<sup>th</sup> dimension provides realism and locality; Einstein's search for completeness.*

**Keywords:** theory of space, superposition, collapse, realism, Loschmidt's paradox, locality, causality, entropy, free will, quantum mechanics interpretation

## 1. Introduction

The weirdness seen by many physicists and philosophers is due to some counterintuitive reasoning in its many interpretations. But mathematics is based on reasoning and logic and the math involved in QM has many orders of magnitude of success; in some cases, 10 decimal places. Fortunately, the theory of space [1] [2] [3] [4] [5] reveals that an intuitive model is achievable and reason and logic will be not only in the quantum math but also in its interpretation.

### 1.1 Law of non - contradiction

The first controversial is the violation of a fundamental principle in philosophy, for example, by Aristoteles 384 - 322 BC in his Metaphysics. It's known as the Law of non-contradiction which says that "A" and "Not A" can't simultaneously exist as one entity. Ontological: It is impossible that the same thing belongs and not belong to the same thing at the same time and in the same respect. " Psychological: No one can believe that the same thing can (at the same time) be and not be. Logical; the most certain of all basic principles is that contradictory propositions are not true simultaneously. This violation is present many times in QM interpretations, like the wave - particle duality, and the superposition of mutually exclusive solutions considered by the powerful liner math. For example, the Schrödinger's is cat alive and dead at the same time, the spin is simultaneously up and down, etc.

The wave - particle duality is overcome by considering the coexistence of two entities and not one entity with two non-inclusive presence. The physical tangible things (elementary particles) as one entity and the physical wavy space is the other entity. The crucial double slit experiment put this in evidence, it is understood as the wavy space, huge enough to pass through both slits and later having a destructive interference between each passage; less or no possibility that the quantum space is present in that interfered zone of 3D.

Its compact particle passes only through one slit but it will be present in 3D meanwhile its space is present; conditioning the compact entity to behave as a diffuse wavy one. If a detector is put across one of the slits, then, only the quantum space that contains the particle will continue and the destructive interference is no longer present; the crucial experiment in QM is solved! Note that this interpretation is quite different from the deterministic De Broglie and Bohm's pilot wave [6] which explain this duality. This theory of space has also realism (the concepts exist independently of the observer) but it's intrinsically indeterministic; on every new space fluctuation, the particle has no condition of its previous 3D scenario, it acquires randomly any eigenstate (poli deterministic, confined to valid states).

In the other case, the superposition of mutually exclusive solutions dismays Schrödinger and Einstein; nature's existence being a probabilistic mixture of two antagonist solutions at the same instance. Logic negation NOT makes impossible any coexistence with logic affirmation IS. Like in Schrödinger's cat, not alive must only mean dead and it is exclusive to life. The next paragraph contains a detailed explanation of the cases of multiple solutions.

### 1.2 Superposition of inclusive and exclusive states.

The second controversial is the direct application of linear algebra reasoning; **if A and B are independent solutions, then their combination will also be a solution.** This reasoning is used in QM and concludes in the superposition of eigen states (quantum - independent solutions). Hilbert's space of functions as vectors is an excellent tool, but they must not violate the logical conjunction AND, nor the logical disjunction OR between each vectorial solution. In other words, when the solutions are AND - inclusive between them, i. e. at the same instance, the linear math goes perfectly. If the solutions are OR - mutually exclusive at the same instance, then linear math can't be used for a single event unless it deals with bunches of events with one - by -

one presence. This thought overcomes mutual exclusive existence employing its average appearance; this statistical presence can be handled by this useful linear math.

For example, the vibration of a violin chord has the addition of its harmonics; this is an AND example. Also, in movement or a vector in 3D, if it moves horizontally or vertically, their combination is real and also an AND example. Note that independent solutions can be expressed in math as an ORTHOGONAL relation, and in vector analysis, their unitary vectors form the orthonormal basis. Keep in mind that this orthogonality can be inclusive or exclusive (disjoint) in the sense of the same time; this can be understood as the complementary presence of the states. On the other hand, a spin is capable of being up or down, their combination at the same instance is nonlogic; this is an OR example. A simpler example is flipping a coin, its upper face can be head OR tail, never both at the same time. Another example can be going from one place to another using a tram, a taxi or by foot. You can be in one or another media but not in two or three of them at the same time; a partial one - by - one situation is plausible and the total result will be the addition of each case.

Reinforcing, the existing in one or the other independent solution is understandable, but exclusive existences all together in 3D is weird for our mind. Besides, there is no observation of any combination of exclusive solutions. Energy can't be divided into fractions of action  $h$  for each simultaneous state; each state will not be quantized! This ambiguous and probabilistic existence was resumed by Einstein as: "Old man" doesn't play dice [7]. The theory of space overcomes this by considering tangible existence as unique but with more than a three longitudinal dimensions scenario. An existence that has a one - by - one random manifestation in 3D between its all - possible solutions, i. e., a poli deterministic existence. No more the classical determinism neither the actual in deterministic quantum world. This philosophical controversy of the addition of exclusive solutions vanishes when the existence is the combination of 3D presence plus the presence at the 4th dimension. Not an intermittent existence in 3D and, in between them, a nonexistence; but an oscillating presence in both scenarios (3D and the 4thD). This continuous existence is sustained by the observed destructive interference and by the necessity of complex numbers (a combination of real and imaginary scenarios) used by Schrödinger, Dirac, Pauli, Jordan and others. Aside from Heisenberg's Uncertainty principle [8] that involves the phase difference between parameters at 3D versus parameters at the 4th dimension.

### 1.3 Collapse of the wave function and the certainty principle.

The third controversy is the collapse of the wave function. Aside from Schrödinger and Einstein's objections, many physicists consider it acceptable that existence can be fully defined by Schrödinger's wave function [9], but why this powerful congregation of solutions has never been seen? how does the wave function transform from a multiple solution to one observable solution? When existence is understood in a multidimensional dimension, its wavy presence in 3D with a clear - define state is a reasonable

expectation. As said before, energy can't be present as a fraction of action  $h$  as superposition assumes for unfrequented solutions. This was what M. Planck [10] considered solving the ultraviolet catastrophe of the black body radiation. For having this clear - define presence, a one - by - one solution at 3D is the correct path, i. e., **the certainty principle** proposed by this novel theory of space. The complexity is preserved in the 4th dimension. An unreplacable dimension where conservation laws are preserved and interaction is achieved. Like the complexity of multiple faces in a dice, one entity that when spins, its upper face has randomly multiple valid solutions. Multiple solutions of one entity can be handled by linear math, but don't infer a superposition of all the faces as one flat mega upper face. Going further with the example, when the dice is at rest, its upper face shows only one of its valid solutions, with no conflict in our mind. The observable collapse is now logic!

### 1.4 The Loschmidt's paradox

The paradox named after Josef Loschmidt, is a conflict of irreversibility obtained from a reversibility process. It is the objection that it should not be possible to deduce a physical macroscopic irreversible process from time - symmetric dynamics of the microscopic fundamental physics. Since physical presence is an aleatory one - by - one solution, its evolution can't be reversible. In other words, random evolution in time can't have retro predictability; i. e., it can't be intrinsically reversible in time. Maybe its eigen states (solutions) aren't to dispense and it will give the appearance of acting as a coherent average value, but not in its detailed quantum scale. **The arrow of time**, developed in 1927 by the British astrophysicist Arthur Eddington, can now be understood as the impossibility of going to the past with the same reverse order of previous random solutions. So, this paradox isn't one; from the quantum scale up to the macroscopic presence, the physical universe behaves irreversibly.

### 1.5 Entropy

There is an implication of the previous paragraph, **the second law of thermodynamics** (first developed by Sadi Carnot in 1824). Since the existence is constantly present in a randomly one - by - one solution, the statistical **Law of the large numbers** is present. Note that the actual thought of superposition is an unchanged mixture of states, this will not be in accordance with the accumulation of cases needed to sustain the statistical law of the large numbers. The one - by - one is a better understanding of nature's entropy and that means that the system will get closer to the average value of all the individual solutions, i. e., its expectation value. So, close quantum systems get evenly over time; its entropy stays the same or increases. Note that entropy is commonly presented as a disorder but evenness is a positive way to describe it.

### 1.6 Locality and cause-effect relation

Locality and causality are challenged by QM with the entanglement particles. A cause sufficiently far that it can't explain the instantaneous effect at a distance. The reader can

remember Einstein's memorable phrase: "spooky action at a distance." Even the alleged ghost acts locally! How can information travel through space instantaneously? This violates the theory of relativity [11] that constrains the maximum speed at which information can travel through space. The theory of space considering that elementary particles with coherent oscillation, are ephemerally outside the 3D solving this relativistic constraint; there is a local relation at the 4<sup>th</sup> dimension. Note that a coherent oscillation is necessary for this common passage to 3D and the 4<sup>th</sup> dimension.

### 1.7 The whole is greater than the parts

Aristotle's phrase can be applied to the union of quantum systems. The new system coherently oscillating, gives a physical behavior greater than to ones from their independent systems. This is the basis of quantum computing; his microprocessor at almost zero kelvin for making the coherent state of its qubits and the polynomial calculation.

### 1.8 The abstract entities and free will.

Aside from polynomial determinism of quantum systems, abstract entities are complementary to physical entities. For example, an empty USB memory stick versus the same one loaded with thousands of pictures; in both situations the quantity of elementary particles is the same; the difference belongs to the abstract entities. A TV physically emits light and noise, but our mind sees images, hears information and has a story; all belonging to the abstract universe. Meanwhile, the tangible - physical entities are sustained by themselves, the abstract entities depend on the physical entities. Like math, language, ethics, moral, etc. that depends on the mind. Also, like software that depends on the hardware; if the hardware is destroyed, its software will also be destroyed. So, abstract constant developments (relations, decisions, experiences, etc.) involved in the physical world, contribute to free will; the future is nondeterministic.

### 1.9 The beginning of time and the beginning of space

From the Lorentz factor [12], time dilation and space contraction are a consequence of the presence of energy. If the Big Bang is confirmed, remember that the huge congregation of energy has no variation of time and distance; each parameter has zero change in its value. In other words, a continuous passage of time with no change in its value and an incipient space with no difference in its longitudinal value. An almost previous eternal passage of time with an unchanged value. Any energy fluctuation will immediately create a beginning in time and space inflation.

## 2. Conclusions

By understanding the 4<sup>th</sup> dimension (Ct) as lambda of local energy and its fluctuation with the observable 3D, it will complete the realism not observed at 3D and provide local causality thanks to the passage at this 4<sup>th</sup> D. Now, this novel interpretation of quantum mechanics makes it complete, Einstein's objections are sustained by a wavy space. The theory of space provides a reasonable and logical model of

the universe at the quantum scale; polynomial determinism, reality and locality are validated. Even more, a philosophy of life with a greater tangible universe not only in 3D but constantly being linked with the 4th dimension.

### Declarations

The author declares no conflicts of interest regarding the publication of this paper.

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